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SECURITY INFORMATION

MINISTRY OF SUPPLY

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT

BOSCOMBE DOWN

TESTS ON A MODIFIED TYPE 'R' PARACHUTE

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VALETTA C No.1 VE 262

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Report No. AAEE/Tech. 84/P.

24. FEB. 1953

AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT
BOSCOMBE DOWN

Tests on a Modified Type 'R' Parachute

Valetta C. Mk.1 VL.262

A. & A.E.E. Ref: AAEE/6615/19
M. O. S. Ref: 7/Acft/6994/RDL.3(c)
Period of Tests: February - May, 1952.

Summary

Operating conditions in jungle areas have made it necessary to be able to drop packages from low heights (approx. 300 ft.) on Type 'R' parachutes. The present Type 'R' assembly which is deployed by auxiliary parachute is unsuitable for this purpose as the deployment interval is too long.

Tests have therefore been made with the Type 'R' assembly modified in alternative ways to give apex tie deployment, with successful results. Packing details of the recommended system are given.

The considerations of this report apply only to packages despatched manually or by means of an ejector platform (2nd part of Report AAEE/842/P) from the paratroop exit of Valetta aircraft, and not to stores dropped by means of the roller conveyor system, nor to containers carried and dropped from the container racks.

Further tests are to be made from Hastings aircraft.

This Report is issued with the authority of

Air Commodore
Commanding A. & A.E.E.

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1. Introduction

1.1 The low level dropping of packages on Type SD parachutes into small dropping zones by manual despatch from the Valetta paratroop exit was covered in the 2nd part of Report A.A.E.E./842/P. Subsequently a requirement arose for the dropping of heavier packages calling for the use of the Type 'R' parachute under similar conditions of speed and height. The present standard Type 'R' assembly is unsuitable for this purpose as it is deployed by means of a spring-loaded auxiliary parachute from a tightly fitting pack, and the deployment interval is too long for low level dropping (i.e. from 300 ft.), particularly at the specified parachuting speed of the Valetta (105 knots A.S.I.) where high initial drag forces on the auxiliary cannot be expected. The speed of the aircraft when dropping must be kept as low as possible in the interests of preserving adequate tailplane clearances.

1.2 An investigation has therefore been made with a view to modifying the Type 'R' assembly to give apex tie deployment, thus bringing the deployment interval to an acceptable value.

2. Description of Equipment

2.1 Description of Parachute

2.1.1 The parachute used for these tests was basically the Type 'R' Ref. 15D/391-398. This parachute was modified in two ways viz:-

(i) The method suggested by this Establishment whereby the auxiliary parachute, static line and pin were discarded and a static line 18 - 22 ft. long substituted and tied (a) to a 50 lb. pack closing tie which replaced the static pin, and (b) via a 1 foot long extension piece to the apex of the main canopy. The apex tie was initially a double loop of No. 8 cord, but after the first two tests (see Appendix A) this was replaced by a single loop of 150 lb. cord. A detailed description of this modified assembly is given at Appendix B.

(ii) A variation of the above method, suggested by R.A.E., whereby the auxiliary parachute and static line were discarded but the static closing pin retained instead of introducing a closing tie. A similar static line 18 - 22 ft. long was substituted, but attached to the static pin instead of the closing tie, and thence via the 1 ft. long extension piece to the apex of the main canopy. The apex tie was, as in the case of (i) above, initially a double loop of No. 8 cord but after the first two tests (see Appendix A) this was similarly replaced by a single loop of 150 lb. cord.

2.2 Description of Containers. The containers used for the tests were as follows:-

(a) S.E.A.C. packs loaded to 200 lb.
(b) Army Wicker Panniers in their unextended condition and loaded to weights between 220 and 350 lb.

2.3 Aircraft Equipment All the tests were made from Valetta C Mk.1 VL. 262 and the stores were despatched by means of an ejector platform as described in A.P. 4208B Vol.1, Sect.1, Chap.4, Para. 11 (based on the 2nd Part of Report A.A.E.E./842/P).

3. Tests carried out

3.1 Bench Tests. The parachute with the A. & A.E.E. modification (para. 2.1.1) was repeatedly checked on the bench. Comparative bench tests of the R.A.E. modification were also carried out.

3.2 Air Tests

3.2.1 36 Drops were made with the parachutes modified in accordance with the method outlined in 2.1.1 (i) above and 36 drops with the

/parachute....

parachute modified as in 2.1.1 (ii) (see Appendix A). All these tests were made with the load contained in Army wicker panniers and with a load of between 300 lb. and 350 lb.

3.2.2 Due to the bending of the pack closing pins on the packs modified by the method given in 2.1.1 (ii), it was decided to continue tests only with the pack modified to have a mouth tie in lieu of a pin (A.& A.E.E. system). Further drops were therefore made with the pack thus modified, 6 drops being made with S.E.A.C. packs loaded to 200 lb. each, at an aircraft speed of 105 knots A.S.I. (20% flap), and a total of 24 drops with panniers at weights of 220, 250, 300 and 350 lb. each weight being tried out at aircraft speeds of both 105 knots and 125 knots A.S.I. (20% flap used in each case).

4. Results of Tests

4.1 Bench Tests. Bench tests showed that the parachute pack modified with the mouth tie would open satisfactorily no matter from which direction the pull on the static line came. In the case of the parachute pack which retained the pin as a method of closure it was found that a pull on the static line, except through a very limited angle, would produce bending forces on the static pins.

4.2 Air Tests

4.2.1 Detailed results of the 36 tests of each type of modified pack are given at Appendix 'A'. From these it will be seen that with an apex tie of 150 lb. cord in a single loop, both methods of modifying the Type 'R' parachute resulted in satisfactory low level deployment, but with the pin closure method damage to the static pins and pack cover occurred in some cases. This no doubt was due to the rotation of the parachute and store preventing clean and direct withdrawal of the pin. No damage or abnormal deployment was experienced with packs modified with the mouth tie. There was no case of the mouth tie tending to hold together the pack petals after being broken by the pull of the static line.

4.2.2 The selected system with mouth tie also gave completely satisfactory results on the subsequent tests described in para. 3.2.2.

4.2.3 Although all of these tests were made using an ejector platform to despatch the stores, the results are regarded as equally applicable to packages despatched from the Valetta paratroop exit as approved by direct manual ejection (e.g. see paras. 4.1, 5.1, 8.1 (iii) and 8.3 of 2nd Part of Report AAEE/842/P). The present considerations cannot however be directly applied to stores despatched in a "stick" by means of the roller conveyor (with overhead static cable), nor to containers carried and dropped from the container racks.

5. Conclusions

5.1 The Type 'R' parachute assembly may be modified in either of the ways described in para. 2.2.1 (using a single loop of 150 lb. cord for the apex tie) to give satisfactory deployment for low level dropping of packages on this parachute. However the method which replaces the static pin by a closing tie is preferred, as the static line pull to break the closing tie is equally effective from any direction whereas the pull on the pin can cause damage to both pin and pack unless the direction of pull happens to be sufficiently in line with the pin to withdraw it smoothly.

5.2 With the Type 'R' assembly modified in this manner it may be used for low level (approx. 300 ft. above the dropping zone) dropping of packages by despatch from the Valetta paratroop exit, subject to the following conditions:-

/(a).....

(a) The packages to be despatched either by ejector platform or by direct manual ejection. The modified parachute has not been considered for use with stores despatched by roller conveyor, nor with containers carried and dropped from the container racks.

(b) The packages to be within the weight and size limitations represented by Army Wicker Panniers in their unextended condition over a weight range of 220 lb. to 350 lb., and S.E.A.C. Packs at weights of not less than 200 lb.

(c) The aircraft to be flown straight and level for the drop, within a speed range of 105 to 125 kts. A.S.I. undercarriage up and with flaps 20% down.

6. Recommendations

It is recommended that the modified Type 'R' assembly as outlined in para. 2.1.1 (i) and fully detailed in Appendix 'B' be approved for use with packages despatched from the paratroop exit of Valetta aircraft under the conditions specified in para. 5.2.

7. Further developments

7.1 Tests are in hand on the dropping of packages of more widely varying sizes and weights from the Valetta paratroop exit, using the modified parachute assembly, with a view to specifying more general limitations of weight, density and size, to give the greatest possible operational flexibility.

7.2 The modified parachute will be tested for use with packages dropped from the paratroop exit of Hastings aircraft.

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Appendix 'A'

Valetta Aircraft - Modified 'R' Type Parachute Pack

Results of tests on alternative modified systems

(a) R.A.E. Modification

Drogue removed, pack closed by standard pin, 22 ft. Static line with Apex tie as below.

Date	Apex Tie	No. of drops	Height above DZ	Remarks
19.2.52.	Double loop of No. 8 (50 lb.) Cord	6	400'	5 deployed but canopies were only partly withdrawn from pack when apex tie broke. On one the apex tie broke before canopy was sufficiently withdrawn to continue to deploy on its own.
20.2.52.	- ditto -	6	400'	All deployed but pin on one static line bent thro' 90°. Canopies only partly withdrawn from pack when apex tie broke.
26.2.52	Single loop of 150 lb. Cord.	6	300'	All deployed satisfactorily but one pin failed to withdraw and in this case the pack split round the base allowing canopy to develop.
28.2.52	- ditto -	6	300'	All 6 deployed satisfactorily.
5.3.52	- ditto -	6	300'	- ditto -
7.3.52	- ditto -	6	300'	- ditto -

(b) A. & A.E.E. Modification

Drogue removed, pack closed by mouth tie, 22 ft. Static line with Apex tie as below.

Date	Apex Tie	Mouth Tie	No.of drops.	Height above DZ.	Remarks
22.2.52	Double loop of No. 8 (50 lb.) Cord	Single loop of No. 8 (50 lb.)Cord.	6	400'	All 6 deployed but film analysis showed that apex tie was breaking when canopy was only partly withdrawn from the pack.
25.2.52	- ditto -	- ditto -	6	400'	- ditto -
3.3.52	Single loop of 150 lb. Cord.	- ditto -	6	300'	All 6 deployed satisfactorily.
5.3.52	- ditto -	- ditto -	6	300'	- ditto -
8.4.52	- ditto -	- ditto -	6	300'	- ditto -
24.4.52	- ditto -	- ditto -	6	300'	- ditto -

Note. All the above parachutes were dropped with Standard Army Panniers (unextended) weighing between 300 and 350 lb. each from Valetta Aircraft flying at 105 knots with 20% Flap. The panniers were despatched by an Ejector Platform.

Full development of the canopies usually occurred at about 150' below the aircraft.

Appendix 'B'

Packing of Modified Parachute

1. The main canopy is serviced and packed as before i.e. in accordance with AP. 1182A Vol.1, Sect.4, Chapter 11, paras. 1-10 inclusive.

2. A static line, similar to that used on the 18 ft. parachute (Stores Ref. 15D/339), is prepared, and to it at the parachute end, is securely looped a 1 ft. extension piece.

3. The apex tie, a loop of 150 lb. cord is passed round all the rigging lines across the vent of the main canopy and through the end loop of the extension piece to the static line. It is tied off with a treble reef knot.

4. The petals of the parachute pack are then closed in their normal order and a tie of single 50 lb. cord passed through the wire loop on No. 1 petal, through the loop at the end of the static line to which is attached the extension piece and then through the eyelets of the petals in order. This tie is pulled tight and fastened with a treble reef knot (Fig. 1).

5. Half the length of the static line is stowed in successive folds working out from the centre beneath the two petals of the pack already provided with static line pockets, and the remainder of the static line is packed in continuous folds in the pockets themselves (Fig. 2).

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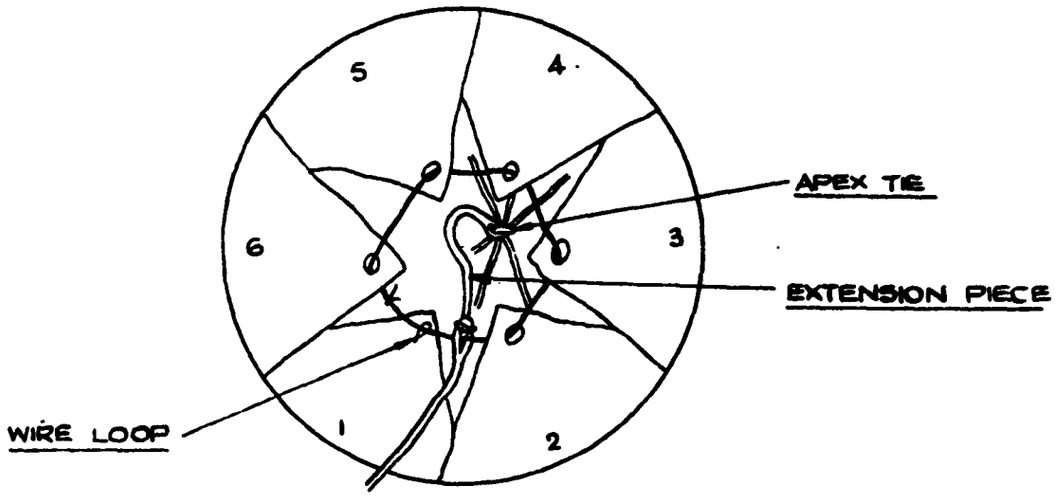
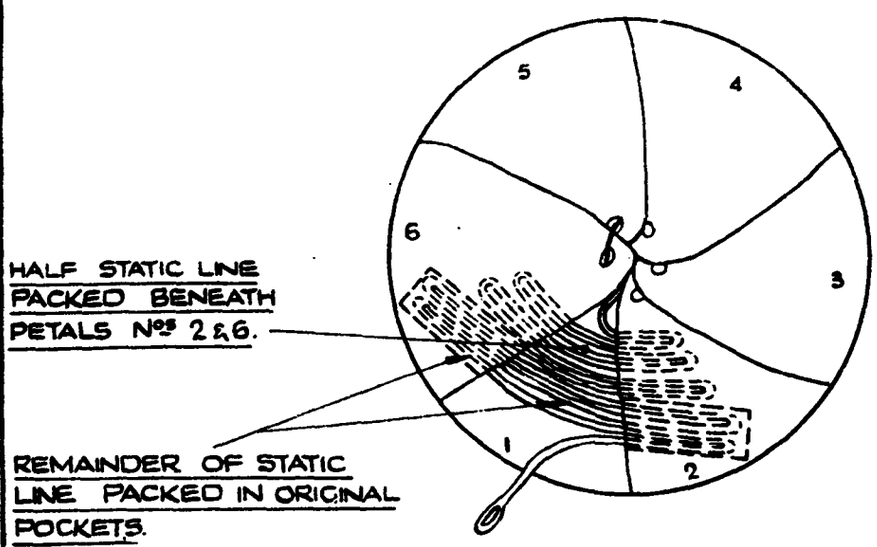
NOTE:- PETALS FORESHORTENED FOR CLARITY.
PETALS NUMBERED IN ORDER OF CLOSING.

FIG.1.



DETAIL OF NEW PETAL TIE.

FIG. 2.



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